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Next Generation Space Instrument Modeling and Simulations for the X-Ray and Particle Sensing Project

J. Barney & K. Smith

Space Science & Applications (ISR-1)

Overview

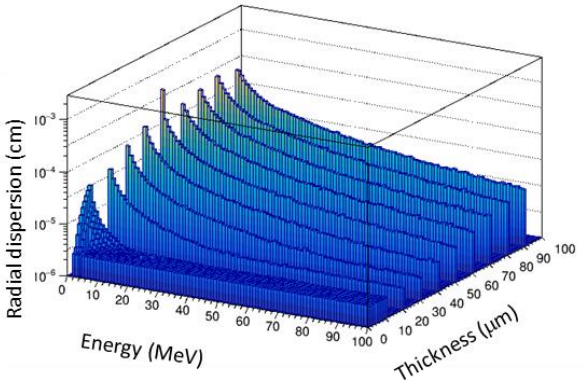
- New simulation tool
- Filter dispersion study
- DRM study

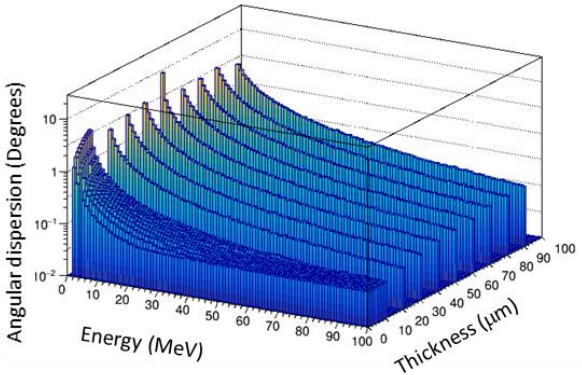
Revised simulation tools

- Utilizing Geant4 multithreading capabilities
- Shared model geometry and physics data for each worker thread
- Reduces memory requirements for large simulations
- Tested and used successfully for the project simulations

Dispersion study

- Thin filters are key components of the Hard Radiation Sensor (HRS). Both as filter elements and for sensitive volumes.
- For particles incident on a thin filter, what is the resulting radial and angular dispersion, as a function of particle energy and filter thickness?
- Studied with protons
- Studied for aluminum, silicon, and beryllium material
- 60 million events thrown

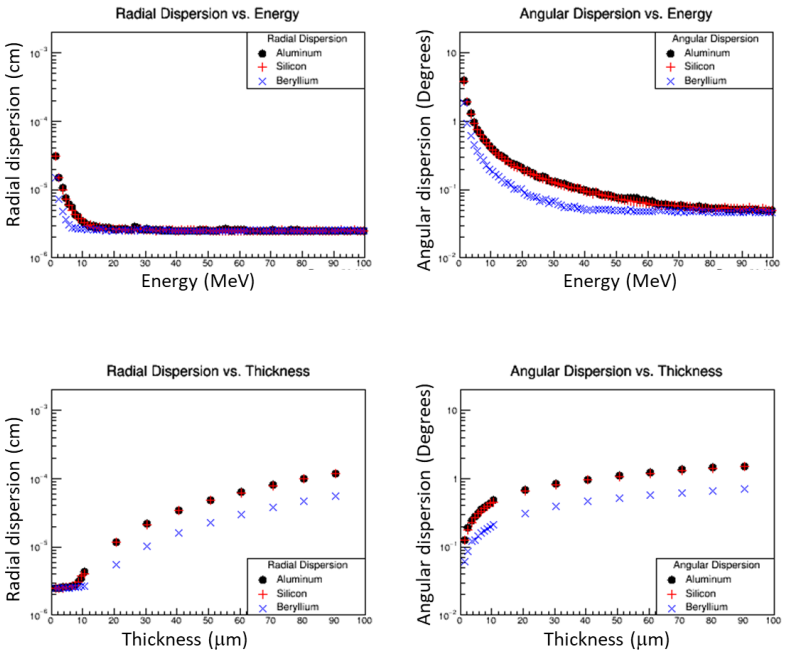




Dispersion for protons incident on an aluminum filter

Dispersion study

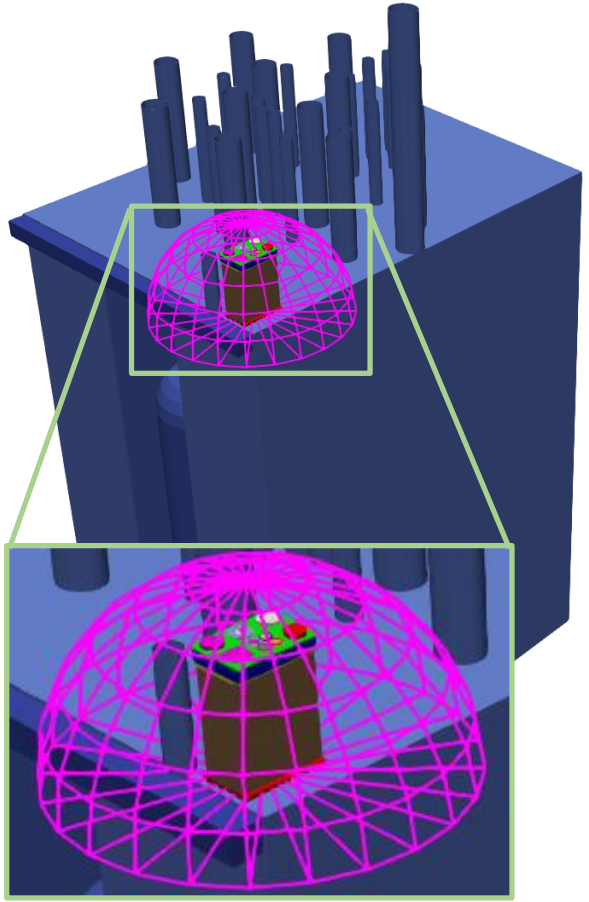
- Results indicate similarity for aluminum, silicon
- Study indicated importance of HPC resource for performing fine-tune studies



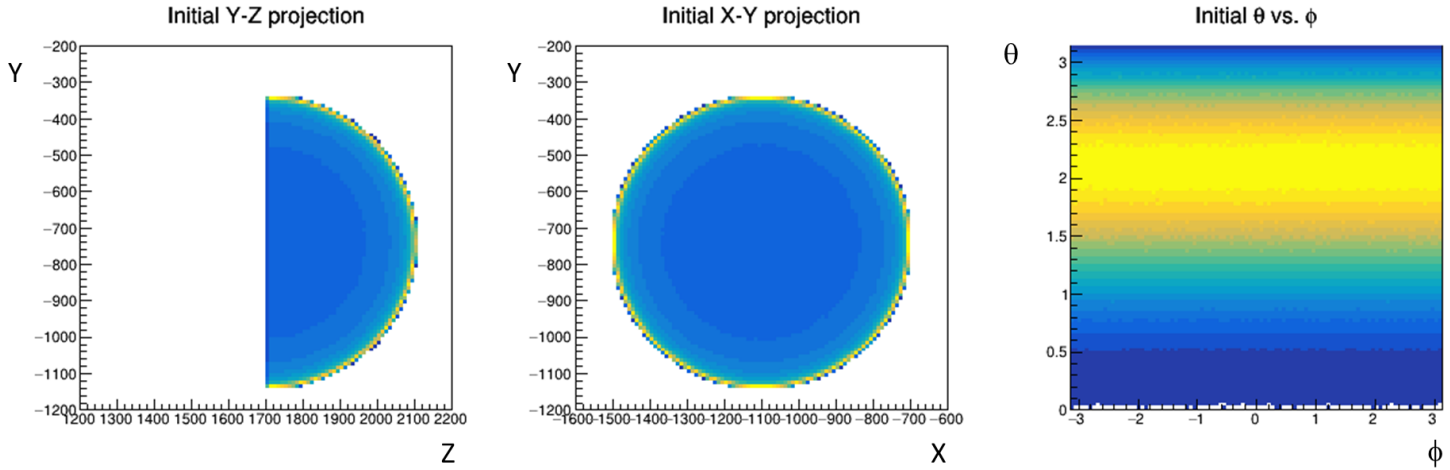
Proton dispersion for three materials. Fixed thickness at 10 μm (top panels), fixed energy at 10 MeV (bottom panels)

X-ray and particle sensing instrument simulations

- 300 million protons, 100 million electrons simulated
- Provides valuable information for analysis of in-flight data



XAPS instrument and surrounding hemispherical distribution for thrown particles

Thrown distribution for X-ray and particle sensing instrument simulations

- Protons and electrons thrown from this distribution
- Provides isotropic flux to detector